SINGULAR VALUE DECOMPOSITION AND STRUCTURED TOTAL LEAST NORM FOR APPROXIMATE GREATEST COMMON DIVISOR OF UNIVARIATE POLYNOMIALS

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To mak, ayah
abang, akak, adik, kak t
hamzah, irfan

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ABSTRACT

This study presents experimental works on approximate GCD of univariate polynomials. The computation of approximate GCD is required in the case of imperfectly known or inexact data which emerges from physical measurements or previous computation error. SVD of Sylvester matrix is used to determine the degree of the approximate GCD. Then, STLN method is employed to generate an algorithm for solving the minimization problem that is to find the minimum perturbation such that the perturbed polynomials have a nonconstant GCD. The formulation of the STLN algorithm lead to the formation of LSE problem and this is solved using QR factorization. Every computation is done using MATLAB. Once the minimum perturbation is found, a MATLAB toolbox called Apalab is used to determine the coefficients of the approximate GCD. Results from experimental work performed reveal that the STLN algorithm presented is as efficient as the existing minimization algorithms.

ABSTRAK

Kajian ini membentangkan kerja – kerja analisa bagi pembahagi sepunya terbesar anggaran melibatkan polinomial pemboleh ubah tunggal. Pengiraan pembahagi sepunya terbesar adalah diperlukan dalam situasi melibatkan data yang tidak diketahui secara sempurna hasil dari sukatan fizikal atau berlakunya ralat dalam pembundaran data. Penguraian nilai tunggal bagi matriks Sylvester digunakan untuk menentukan darjah pembahagi sepunya terbesar anggaran. Seterusnya, kaedah jumlah norma terkecil berstruktur digunakan untuk menjana algoritma bagi menyelesaikan masalah peminimuman iaitu untuk mencari pengusikan minimum supaya polinomial terusik yang dihasilkan mempunyai pembahagi sepunya terbesar bukan malar. Formulasi algoritma jumlah norma terkecil berstruktur menghasilkan pembentukan masalah kuasa dua terkecil dengan pembatas kesamaan dan ini diselesaikan dengan menggunakan kaedah pemfaktoran QR. Setiap pengiraan dilakukan dengan menggunakan perisian MATLAB. Apabila pengusikan minimum telah didapati, sebuah modul perisian MATLAB yang digelar Apalab digunakan untuk menentukan pekali bagi pembahagi sepunya terbesar anggaran tersebut. Hasil dari kerja – kerja pengiraan yang dilakukan menunjukkan algoritma jumlah norma terkecil berstruktur yang dibentangkan adalah secekap dengan algoritma yang sedia ada.